

MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for September, 1898, is based on about 2,940 reports from stations occupied by regular and voluntary observers, classified as follows: 147 from Weather Bureau stations; numerous special river stations; 32 from post surgeons, received through the Surgeon General, United States Army; 2,583 from voluntary observers; 96 received through the Southern Pacific Railway Company; 29 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 31 from Canadian stations; 20 from Mexican stations; 7 from Jamaica, W. I. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological and Magnetic Observatory of Mexico; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kim-

ball, Superintendent of the United States Life-Saving Service; and Commander J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to generally conform to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

The most important meteorological event of September, 1898, was the hurricane which visited the Windward Islands of the West Indies on the 10th and 11th.

As shown by the report, published herewith, of the United States Weather Bureau observer at Bridgetown, the storm was particularly destructive throughout the Island of Barbados, where 83 persons were killed, 150 injured, and property to the estimated value of \$2,500,000 was destroyed. At St. Vincent and St. Lucia the violence of the hurricane during the 11th appears, from a report rendered by Mr. H. Powell, Curator of the Botanic Garden at Kingston, St. Vincent, to have equaled or exceeded that manifested at Barbados the night of September 10. Accurate information regarding losses on these islands is not, however, at hand. After the 11th the hurricane center moved northwestward with a very marked loss of strength, and finally disappeared east of the Bahamas during September 14.

The action of the Weather Bureau in issuing warnings and advisory reports in connection with this hurricane is detailed in the description of the storm which follows, and the hurricane track, together with the general distribution of atmospheric pressure which attended the progress of the storm is plotted on special charts which appear in this issue of the REVIEW.

On September 25 a second storm of tropical origin appeared as a feeble disturbance over the eastern part of the Gulf of Mexico. During the 26th this storm moved northeastward

over the Bahamas, where it developed almost hurricane violence and caused considerable damage on some of the more northern islands of that group. Atlantic coast ports and interests were advised of the progress and character of this storm, which was not, however, severely felt on the United States coasts. Unfortunately the Nassau, Bahamas, morning report of the 26th was not received, and warning of the storm's increasing intensity could not, therefore, be given until the receipt of a special noon report from Nassau. The path of this storm is plotted as low area X.

During the last two days of September a storm developed in the vicinity of the island of Santo Domingo, and moved thence northwestward to the south Atlantic coast of the United States, where it raged with hurricane violence during October 2. This storm will be made the subject of a descriptive article in the MONTHLY WEATHER REVIEW for October, 1898.

No reports showing severe storms have been received from the Pacific coast districts, and no serious disturbance occurred in the Chicago forecasting district.

THE WINDWARD ISLANDS HURRICANE OF SEPTEMBER 10-11, 1898.

Although the weather over the Lesser Antilles had been unsettled for several days there was no certain evidence of an approaching hurricane until September 10, when the

regular morning reports, supplemented by a special report, cabled at 12:40 p. m. by the United States Weather Bureau Observer at Bridgetown, Barbados, showed the presence of a cyclonic disturbance southeast of the Windward Islands.

Hurricane warnings were immediately cabled to Weather Bureau stations in the Lesser Antilles, and the officials in charge were directed to give the widest possible distribution to the warnings in their respective districts. They were informed that the hurricane would move from a point south-east of Barbados slowly northwestward with increasing force. Advisory messages were sent to other islands cooperating in the work of observation and report as far west as Jamaica and eastern Cuba, and to points on the South American coast of the Caribbean Sea, and also to Admiral Watson's fleet lying in the harbor of Caimanera, Cuba.

Moving in a northwesterly direction the storm passed over Barbados the night of September 10, and reached St. Vincent and St. Lucia during the day of September 11. The character of the hurricane at the islands visited is indicated by the following extracts from the local press and reports of observers:

The Barbados Agricultural Reporter, September 13, 1898:

Saturday night, the 10th of September, 1898, will live forever in the memory of the present generation of Barbadians. Never since the memorable 11th of August, 1831, has the island been visited by such a fearful hurricane, which extended over the period of ten hours during the dark and dreary watches of the night. For days previous much rain had fallen, but the barometer remained steady, and it was only on Saturday evening that it gave signs of the approach of a hurricane. By 7 p. m. it had dropped to 29.669, and the howling, fitful gusts of wind proclaimed the rapid approach of the storm. Previous to this the observer at the United States Weather Bureau, Mr. P. McDonough, had warned the harbor authorities of the situation, and the captains of the various craft in port were also warned to be on the outlook. The blow began about 7:30 p. m. on Saturday, and continued until 4 a. m. Sunday.

The Barbados Advocate, September 17, 1898:

Fiercer and more destructive hurricanes may have visited the West Indies in years past, but taking into consideration the general condition of her industry and its gloomy prospects, never has a more appalling calamity fallen on this island since first it rose out of these western seas, than the fearful hurricane that ravaged it from shore to shore on Saturday night last.

Saturday morning was dark and lowery, and the indications of approaching bad weather were strong. At noon Mr. McDonough, of the United States Weather Bureau, notified the public that a hurricane was fast approaching Barbados. The barometer had been falling rapidly. At 6 p. m. the clouds gathered densely in the northeast, and the wind commenced to blow freshly from that point. The rain fell heavily, and the clouds continued to gather in dark, ever-wheeling volumes, the higher banks forming scuds flying rapidly to various points; at 7 p. m. the barometer had fallen to 29.66, and the wind had increased in force and violence until a strong gale was blowing. At 9 p. m. the wind was blowing with hurricane force.

Report of Mr. P. McDonough, observer, United States Weather Bureau:

The weather on the days immediately preceding the date of the hurricane was nothing out of the ordinary. Showers had been frequent from the 1st to the 10th without any material change in the barometer. A sharp look out was kept for the movement of the upper clouds when the state of the sky permitted, and those observed were principally cirro-stratus from the south. Three or four days preceding the date of the hurricane the sky was unusually overcast, and but little opportunity presented for observing the movement of the upper clouds. In the early forenoon of the 8th cirrus clouds appeared moving from the southwest, with the wind northeast, and some cumulus which in the early morning moved from the northeast, changed direction to the southeast, the weather becoming rapidly threatening, with an unusual number of showers. During the 9th there were frequent light showers with intervals of sunshine, but in the afternoon the sky put on an unusually threatening appearance with alto-stratus moving from the east and cumulo-nimbus from the northeast. A very faint solar halo was observed at 4 p. m. The wind was generally from the northeast, with the barometer falling slightly. A thunderstorm occurred in the early morning of the 10th with light rain which ended at 4 a. m. There was a light shower between 10:50 a. m. and 12:30 p. m., and from 1:15 p. m. throughout the night.

Cirrus clouds were observed moving rapidly from the south in the morning of the 10th, changing formation to strato-cumulus and nimbus from the northeast early in the forenoon. The weather was muggy and oppressive, but temperatures were not abnormally high. Wind generally northeast, but backing to the north. The barometer rose slightly until about 9 a. m., and began to fall from about 11 a. m. The weather in the meantime became very threatening, with light sprinkling rain. The sea became heavy, with a heavy swell from the southeast. From 2 p. m. to 5:45 p. m. the barometer fell very slightly, and there was no increase in the wind force, which changed to the north. Immediately after 6 p. m. the barometer fell very rapidly, the wind freshening up, and almost suddenly attained the velocity of a gale, with a heavy down-pour of rain, which continued during the night. The wind blew steadily from the northeast from 7 p. m. to near midnight, when it changed to the north. While the wind may appear from the records to have increased in force steadily, yet it is characteristic of the winds at this place to blow in strong gusts, and during the passage of the hurricane on the night of the 10th, winds of this character were quite frequent and they must have attained a much greater velocity than is shown on the anemometer record sheet. It was one of these blasts that carried the instrument shelter from the roof, and blew down the wind vane and anemometer support. The greatest velocity for five minutes was 62 miles per hour, N.E., 10:01 p. m., and the greatest for one minute, when the apparatus was blown down, 10:18 p. m., was at the rate of 75 miles per hour. The instrument shelter was destroyed and the instruments within it were broken or rendered unserviceable. The wind vane support was bent out of shape and vane was broken. The tipping bucket rain gauge was upset, but not rendered unserviceable. There is no self record of wind or rainfall from 10:18 p. m. until after the a. m. observation on the morning of the 11th, as the wind blew with such violence during the night of the 10th that it was impossible to make any temporary repairs by which the record could be continued. The wind changed to the north about 11 p. m., and it is my belief that it attained a much greater velocity between 11 p. m. and midnight than at any other time. It abated some after midnight, but a strong gale was maintained up to the observation on the morning of the 11th.

The barometer reached its lowest, 29.462 at 9:20 p. m., after which it rose rapidly.

During the storm there was a remarkable electric display over the entire heavens, but no thunder was heard. In the southwest, at a great distance, there appeared a brilliant, permanent light, but no explanation can be given of this phenomenon. Many persons have reported having experienced an earthquake shock, but none was felt at this office.

The rainfall from 6 p. m. of the 10th to 10:30 a. m. of the 12th was very heavy, 11.42 inches falling in that time.

In the table which follows will be found the most salient meteorological features connected with the storms.

Time.	Barometer, reduced to sea level.		Wind, Sept. 10.		Rainfall, inches.	
	Sept. 10.	Sept. 11.	Vel.	Dir.	Sept. 10.	Sept. 11.
1 a. m.	29.90	29.65	9	ne.	.....	.60†
2.....	29.88	29.68	6	ne.	.....	.40†
3.....	29.88	29.71	9	ne.	.....	.30†
4.....	29.88	29.74	8	ne.	.....	.25†
5.....	29.88	29.77	7	e.	.....	.25†
6.....	29.89	29.80	7	ne.	.....	.45†
7.....	29.90	29.81	9	ne.	.....	.26
8.....	29.91	29.85	11	ne.	.....	.17
9.....	29.92	29.88	11	ne.	.....	.19
10.....	29.91	29.89	12	ne.	.....	.29
11.....	29.90	29.89	9	ne.	.....	.02
12 noon.....	29.87	29.88	8	ne.	.....	.01
1 p. m.	29.81	29.87	7	n.	T.	.07
2.....	29.79	29.86	11	ne.	.....	.08
3.....	29.76	29.83	9	n.	.....	.02
4.....	29.75	29.83	10	n.	.....	.01
5.....	29.73	29.87	13	n.	.....	.02
6.....	29.70	29.88	17	n.	.....	.13
7.....	29.58	29.88	31	ne.	.....	.07
8.....	29.55	29.90	36	ne.	.....	.20
9.....	29.47	29.92	43	ne.	.....	.59
10.....	29.49	29.91	54	ne.	.....	.68
11.....	29.55	29.90	* n.	.....	1.00†	.01
12 midnight.....	29.59	29.88	* n.	.....	.85†	T.

* Anemometer blown down. † Estimated.

In connection with the movement and development of the hurricane the following extracts furnished by Captain Mortois, of the French barque *Tourney*, sailing from Calcutta, may be of interest:

Midday, September 9, latitude 12° 2' N., longitude 54° 2' W., from Paris, ran into hurricane. Strong wind blowing from northeast, with heavy swell. Barometer 29.6, wind increasing in force after midday, and barometer falling one-tenth inch per hour from 4 p. m., reaching 29.1 at 7 p. m. Wind during that time changing from northeast to north-northeast, with heavy rain squalls. At 7 p. m., bright lightning in the southwest, barometer rising, reaching 29.5 at about midnight,

and wind went to southwest, blowing exceedingly strong. At 11 p. m., relative calm, but tremendous sea. On the 10th, about 350 miles to the east of Barbados, 7 a. m., the barometer read 29.7. Calm until midday, wind afterwards going to the northeast. From 10th to 12th, vessel driven 60 miles northward out of her course. Strong current during that time moving toward the northwest. On the 13th, it was observed that another current, but not so strong, was moving toward the northwest. The vessel lost all sail, and her cargo of rice nearly a total loss. The vessel reached Barbados on the 15th. While on board the vessel an examination was made of the captain's barometer and it was found to read about 0.25 too low.

It was very fortunate that there were so few vessels in the bay and harbor on the day of the storm, as it affords little or no protection. The British man-of-war *Alert* departed at about 6 p. m. to avoid the storm. Of the small vessels in the harbor and bay, nearly all of them took precautions to weather the storm by putting out extra anchors and lines, which proved of little value, as most of them were driven out to sea or else beached. The following ships were anchored in the bay and with extra anchors out were driven before the wind and totally wrecked on the reefs at St. Vincent, about 100 miles to the westward:

Full-rigged ship *Loando*, 1,448 tons; bark *Lapland*, 582 tons; and barkantine *Grace Lynwood*, 600 tons. The crews of these vessels were saved.

Barkantine *Lordahl*, 342 tons; local vessels, *Kate Florence*, *Florence B. Parr*, Government water boat *Florence*, steam crane and dredger all were driven out to sea and have not been heard from.

The following local vessels were driven on the reefs on the shore at this city:

Campania, *Elmo*, *Ocean Traveller*, and a large number of lighters, all of which are a total loss. The water department steamer, *Ida*, was also driven on the reefs here, but was gotten off without much damage. A large number of shore boats and lighters were driven out to sea and swamped.

The destruction of property throughout the island has been very great. Every part of the island suffered, but the eastern and southern portions most. It will take some time to get anything like an accurate estimate as to its value.

In this city the damage to property has been very great, especially in the suburbs. The business part of the city suffered very little, other than that caused by rain. The residential and unprotected portions of the city suffered very much, and it would be impossible to give a detailed description of the houses and trees strewn over the various streets in those sections of the city on the morning of the 11th. Such chaos I never witnessed, and have no desire to experience anything of the kind again. While the houses blown down are frail-frame buildings—yet the largest kind of trees were either broken in two or lifted out of the ground by the roots. Nearly all the trees that were blown down, as far as I have seen, were blown down toward the east or south, and a large number of the houses fell outward. The trees left standing had their foliage cut off as if done with a knife or an axe, this is especially true of the palms. Two stone bridges are seriously damaged, one so badly that it has been railed off to prevent traffic. A portion of the wharf was undermined and carried away, and during the night of the 10th the seas came over portions of the wharf into the streets.

Many of the streets were impassable for several days after the storm, especially for vehicles. The street car service was prostrated on the 11th, and but little service given on the 12th.

The entire telephone system was prostrated, thousands of poles being blown down and the repairs necessary will be almost equal to establishing a new plant.

No storm of like nature is remembered by the oldest reputable citizens, and many compare it to that of 1831, but statistics do not support them in that assertion as will be seen from the following comparative data:

Hurricane of August 10–11th, 1831, total killed, 1,477 outright; total injured, 310, of which 114 died; value of property destroyed, \$7,397,532.

Hurricane of September 10–11th, 1898, lives reported lost to date, 83; estimated injured, 150; estimated value of property destroyed, \$2,500,000; total number of houses totally destroyed, 5,062, and number more or less damaged, 2,359. The number of people estimated to be rendered homeless is set at between 40,000 and 45,000, and this is not considered an overestimate.

It is too early to get an estimate as to the damage to the sugar cane crops, but it is expected to be considerable. The damage done the various plantations in the eleven parishes of the island is very great and means ruin to some.

On Saturday afternoon of the 10th the public, as far as I could do so, was informed of the impending conditions. It being so long since this island was visited by a very destructive storm many believed it immune from such destructive agencies, and pooh-poohed the information given out.

It is not known as to the extent the general public benefited by the information obtained from this office, but I have been informed by some that by acting upon the information given them they were enabled to take measures to protect their property which otherwise might have been lost.

Between 4 and 6 p. m. of the 10th there were about 200 personal inquiries made at this office, and nearly as many telephone calls during the afternoon, relative to the approaching storm, and all were advised as to the danger anticipated.

Extract from report of the hurricane at St. Vincent, W. I., September 11, 1898, by H. Powell, curator, Botanical Gardens:

The barometrical readings have been corrected for index error, elevation, and temperature. Station: Botanic Gardens, Kingstown, St. Vincent, W. I. Height above sea level, 203 feet; longitude, 61° 15' W.; latitude, 13° 10' N.

Indications of the coming storm were manifest in the usual barometrical disturbances. The readings ranged from 29.926 at 3 p. m. on the 6th to 29.838 at 3 p. m. on the 10th.

The latter reading at once caused alarm, and notice of same was sent through the telephone to the police headquarters and other centers, for dissemination.

Later in the evening the barometer continued to fall, and messages were again sent in the usual manner.

At 5:55 on the following morning (Sunday, September 11) the reading was 29.724. The wind at this time was blowing in short but fitful gusts from north and northwest. * * * The barometer continued to fall slowly, and the wind, still blowing from the same quarter, freshened considerably, so much so that a tall cabbage palm was snapped in two and branches of the softer wooded trees were torn off shortly after 7 a. m. Between 7 and 8 a. m. telephonic communication was interrupted. At 9 a. m., the usual ordinary hour of recording observations, the barometrical reading was 29.606. The wind was then rushing from between north and west. At 10 a. m. the barometer had fallen to 29.539, and it was at this hour that the storm was seen to have commenced in earnest. Large branches of trees were being torn off and carried away. The first part of the storm lasted from 10 a. m. to 11:40 a. m. The wind still continued blowing from north, northwest, and west, and increased in such force at 11 a. m. that the largest trees were uprooted.

The following barometrical readings, taken at the time specified, show the rapid fall of the mercury and the awful violence of the storm:

a. m.		a. m.	
10:00.....	29.539	11:30.....	28.719
10:30.....	29.408	11:25.....	28.669
10:55.....	29.119	11:35.....	28.519
11:10.....	28.819	11:40.....	28.509

At 11:40 a. m. there was a lull and almost a dead calm for about three-quarters of an hour. * * * The rain gauge was emptied, and 4.94 inches were found to have fallen between 9 a. m. and 12 noon. At about 12:25 p. m. the wind suddenly began to blow from due south and increased in force every minute. Trees and houses in the same exposed positions which had withstood the first part of the hurricane were now hurled to the ground. Between 1 and 2 p. m. the storm reached its highest point, the velocity of the wind far exceeding that of the forenoon. This continued until about 2:20, when the wind slackened considerably. During the lull between 11:40 and 12:30 the barometer remained steady at 28.509, and then commenced to rise slowly, and afterwards arose almost as rapidly as it had previously fallen. At 3 p. m., the usual hour for recording observations, it had risen to 29.533, and the storm had so abated as to render it safe to go outside. Up to now the rain had descended in torrents, but, unfortunately, the rain gauge had been knocked over by a large branch of a tree.

From 12 noon to 3 p. m. fully as much rain must have fallen as that registered between the hours of 9 a. m. and 12 noon. From 3 p. m. of the 11th to 9 a. m. on the 12th, 4.23 inches fell, the total rainfall thus actually measured during the twenty-four hours was 9.17 inches. The actual time of the duration of the hurricane was as follows: 10 a. m. to 11:40 a. m., 12:25 p. m. to 3 p. m. From 10 a. m. to 11:40 a. m. the mercurial barometer fell 1.030 inches, viz, from 29.539 to 28.509. As previously stated the wind at the commencement of the storm blew from north, and subsequently from northwest. When the first part of the storm was at its highest it was blowing from northwest to west, but was hardly stationary at any point.

After the lull between 11:40 and 12:25 it blew directly from the south and occasionally south-southwest. From 3 p. m. the barometer rose very slowly, and at 7 p. m. the reading was 29.771. Distant thunder and lightning was recorded at intervals during the morning and afternoon. * * * As illustrating the violence of the wind the heavy garden seats were toppled over as though they were playthings. Nearly the whole of the large trees in the Botanic Garden and Government House Grounds, and also in the surrounding country, have either been partly destroyed or thrown down.

The velocity of the wind during the first part of the storm, between 11 and 11:40, was from 50 to 60 miles an hour, and between 1 and 2 p. m. during the second part of the storm it was fully 90 to 100 miles.

There are persons still living in St. Vincent who clearly remember the "Great Hurricane" of the 11th of August, 1831, and who state that the present one is in every way far more destructive.

The cyclone of the 16th August, 1886, is said to have lasted but a few minutes. Aneroid readings taken at that time are given as 29.300.

Compared to the present hurricane the one of 1886 is said to have been mere "child's play."

Out of a total number of 356 hurricanes recorded as having taken place in the West Indies during the last 308 years, 246 occurred in the months of August, September, and October.

It is recorded that in the hurricane of Guadalupe, September 6, 1865, the barometer at Marie Galante fell 1.693 inches (from 29.646 to 27.953 inches) between 6h. 30m. and 7h. 40m. a. m., i. e., in an hour and 10 minutes.

Report of William B. Stockman, Weather Bureau Forecast Official, at the Central Station of the West Indian Weather Service at Kingston, Jamaica:

The conditions obtaining at Port of Spain on the morning of Saturday, September 10, led me to believe that hurricane conditions were indicated to the south-by-eastward of that station, but the apparent rise in barometer from the preceding evening caused me to deliberate, feeling assured that were I correct the conditions would develop sufficiently to insure the voluntary sending of specials from Port of Spain or Bridgetown. Immediately upon the receipt of the p. m. reports of the 10th. I ordered hurricane signals hoisted at Bridgetown, St. Pierre, St. Kitts, and St. Thomas.

From the Daily Gleaner, Kingston, Jamaica, September 16, 1898:

Among the most notable features attending the hurricane, was the action of the United States Weather Station at Half Way Tree. This station was only established a few weeks ago, under the scheme of the Washington Bureau for covering the meteorological observation of the West Indies more effectually than heretofore; and already the new station has more than justified its existence. From the data which, with more or less regularity, have been coming to hand, Mr. Stockman, on Saturday night, cabled hurricane warnings to Barbados, Martinique, St. Kitts, and St. Thomas. The message prognosticated a hurricane, immediately, the central portion of which was south of Barbados, that its direction was moving north-northwesterly and increasing with northerly wind and rains. Every one of these details has been substantiated. Fortunately, as we have seen, the warning was not required for the two more northerly of the islands notified; the hurricane abating its force somewhere in the region of St. Kitts. The Weather Bureau has distinctly shown that it can not alone inform people that a hurricane has taken place, after the damage is done, but can give sufficient warning before hand to prepare masters of vessels for impending danger.

The storm did not attain great severity at other of the Windward Islands, except in the effect of heavy sea swells, high tides, and heavy rain. The Weather Bureau Observer at St. Kitts reports that—

While the hurricane passed that island with only a slight brush, doing no material damage, the public expressed a high appreciation of the warning of the approach of the storm, and that the warning, being verified, established confidence in the Service.

After September 11 this storm lost strength rapidly, and there is no evidence at hand to show that during its subsequent northwesterly course over the eastern Caribbean Sea and the ocean to the northward it exhibited destructive violence.

The distribution of atmospheric pressure, as shown by the morning and evening reports of September 10 and 11, is presented on Charts XIV and XV, and the path of the disturbance, after the 11th, is plotted on Chart XV.

In referring to the work of the Weather Bureau in connection with the hurricane of September 10-11, and the south Atlantic coast storm of October 2, the New York Times of October 5, 1898, commented, editorially, as follows:

There is full justification for the pride with which the Weather Bureau officials call attention to the triumphs of their new West Indian service. Though hardly well established yet, that service has already demonstrated its value beyond all question by giving timely warning of two great storms. To be sure, enormous damage was done in the one case at Barbados and St. Vincent, and in the other on our own southern coast, but of course hurricanes will not be made harmless, even when accurate predictions of their approach are made. The most that can be expected is to save many vessels at sea and many lives on shore. That both of these things were done by the Weather Bureau's forecasts of the recent tempests is certain. The new stations have begun extremely well. Even now they have paid expenses for years to come, and it is a source of gratification that their benefits, instead of being monopolized at home, have been shared by friends beyond our frontiers.

The following is an extract from an editorial which appeared in the New Orleans Times-Democrat of September 24, 1898:

We were able to test this new service in the recent hurricane of September 10 and 11. The storm which prevailed then was first noticed in an inchoate condition near Barbados on September 10. All the other West Indian islands were notified from Washington, and it was in consequence of that notice that the Spanish vessels at San Juan de Porto Rico, which were to have sailed for Spain on that day, delayed doing so, escaping the storm and saving, in all probability, many lives by their delay. Every seaport that could be reached by telegraph was notified; the vessels remained in harbor, and the hurricane—a very severe one—swept through the Caribbean and Gulf of Mexico without injuring a single vessel. So much for our new weather stations. There was some loss of life in the interior of the islands where the warning could not reach in time, but this was infinitesimal compared with the damage that might have been done and would have been done had the approach of the storm not been known one or two days beforehand.

The hurricane was very severe among the smaller Antilles, and wasted most of its force before it reached Cuba. All we caught of it was a violent rainstorm. But although it was not as widespread as some other Gulf hurricanes, it was as severe in its intensity where it did rage. By the warning given by our weather service, property in value a hundred times the cost of the service was saved. The wisdom of the new stations is thus clearly proved. Louisiana ought to appreciate the improvement, for probably no part of the country is more affected and more directly interested in hearing of the approach of these hurricanes. With timely notice vessels will not leave here in the face of a storm. The thousands of fishermen along the coast can receive warning in time and escape the fate of their comrades at Cheniere Caminada. Finally, the sugar and rice crops are deeply interested in knowing of an approaching blow, which will give the planters and farmers a chance to care for the crops, to harvest the rice or cut the cane before the storm breaks over them.

In enumerating the benefits of the war we must not overlook the improvement it has assured us in our weather service on the Gulf and south Atlantic, an improvement that would scarcely have been made—certainly not made for years—if the safety of Sampson and Watson's fleets and Shafter's army had not demanded the establishment of additional weather stations in the West Indies.

THE CHICAGO FORECAST DISTRICT.

The frost warnings issued on the 5th, 6th, 8th, 9th, and 10th were, as a rule, verified, although in some instances the area covered by the warnings was too great.

No general windstorm passed over the upper Lake Region during the month. The wrecks which occurred on the 19th over the northern portion of the Lakes were mainly due to dense smoke, brought by the winds from the British Northwest. The winds were only fresh to brisk northwesterly, except at the "Soo," where a high wind prevailed for a short time. The wind force and direction were covered by the upper Lake forecast.—H. J. Cox, Forecast Official.

SAN FRANCISCO FORECAST DISTRICT.

California was visited by a general and quite heavy rain on September 24, 25, and 26. The approach of this storm was seen on the evening charts of September 23, and forecasts were issued for all points in California north of the Tehachapi Mountains. On the next morning warnings of the approach of this storm were sent to all points in southern California. Thousands of crates of raisins and prunes were exposed for drying. The warnings, which were twenty-four to forty-eight hours in advance of the rain, gave ample time for protection.

THE EARLY RAINS.

Referring to benefits derived from forecasts of early rains, issued by the Weather Bureau Office at San Francisco, Cal., the San Francisco Call of September 27, 1898, remarks, editorially, as follows:

Our early rains have begun this year with showers of such profusion as to give promise that we are to have anything rather than a dry winter this season. They have, moreover, been widespread, and have carried their blessings to almost every section of the State.

Chart X. Tracks of West Indian Hurricanes. August, 1878-98.

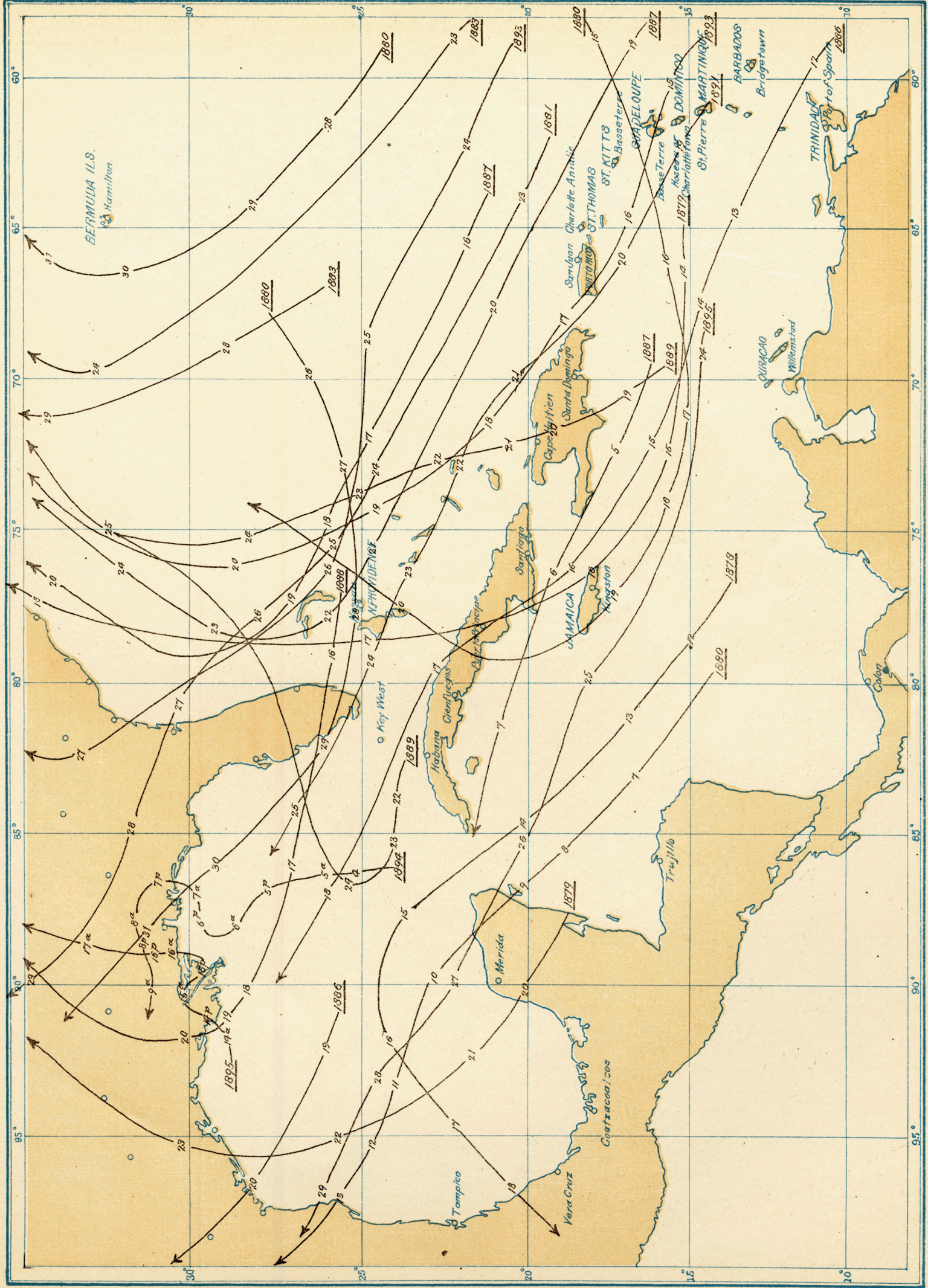


Chart XI. Tracks of West Indian Hurricanes. September, 1878-98.

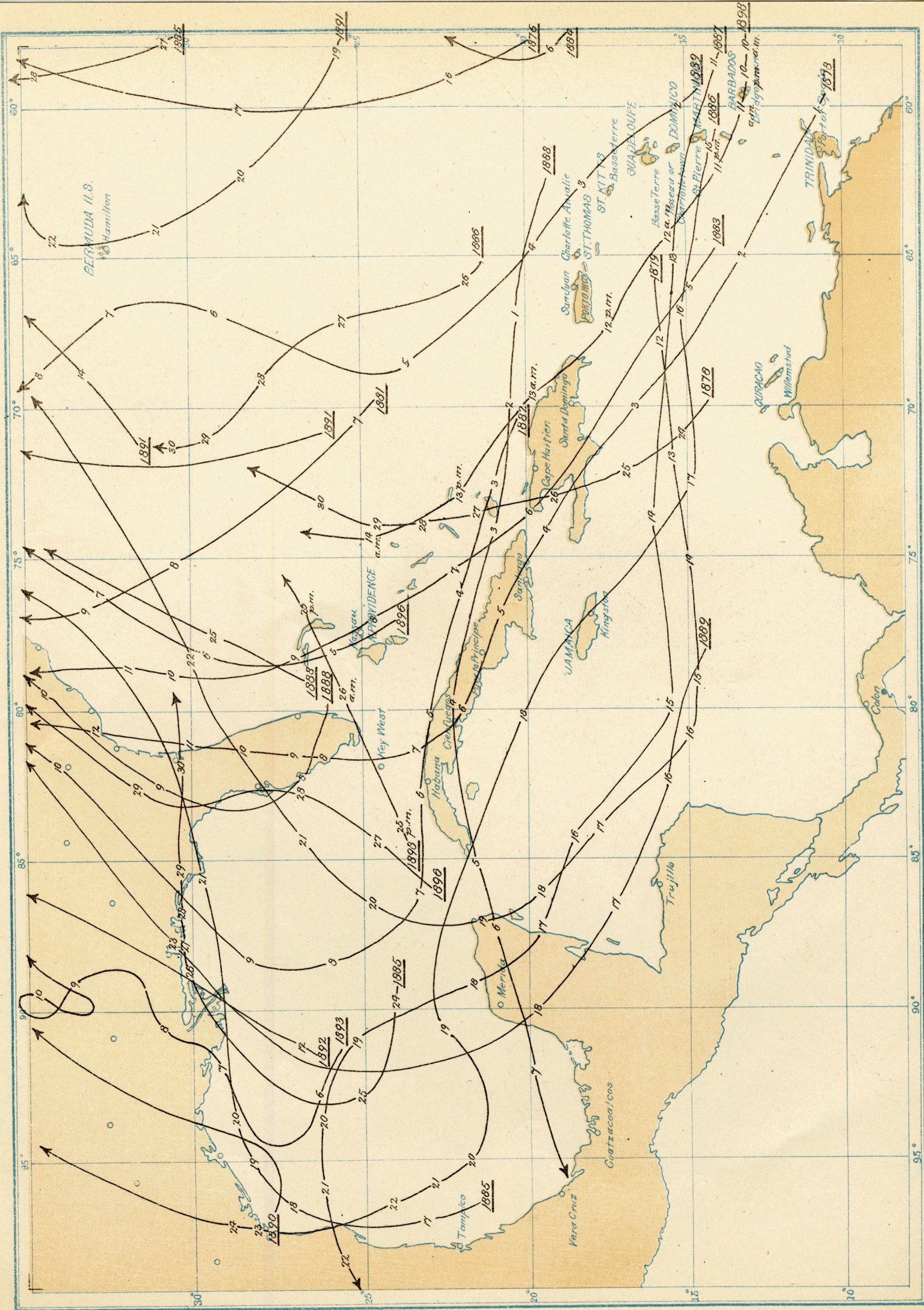


Chart XII. Tracks of West Indian Hurricanes. October, 1878-97.

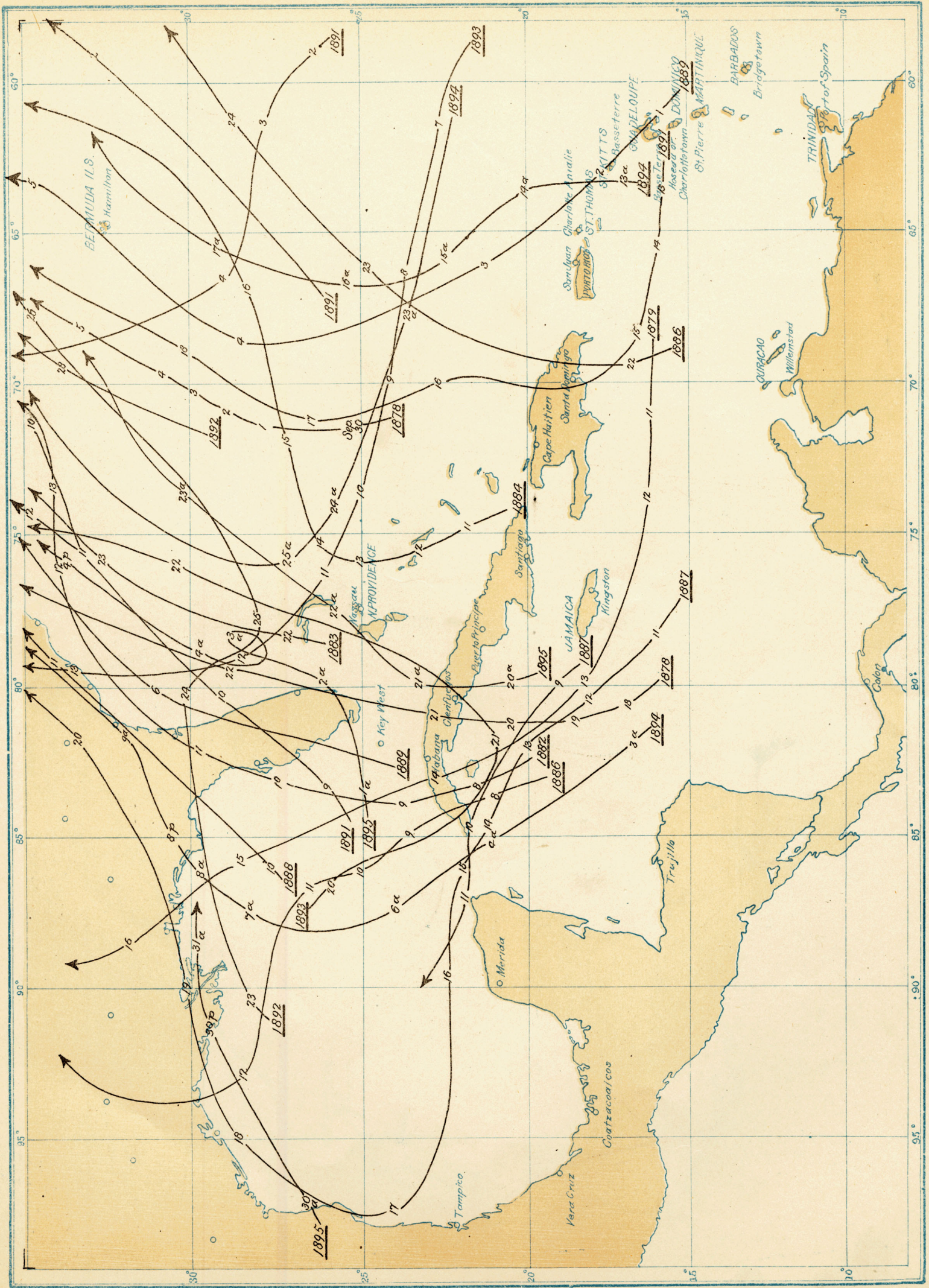
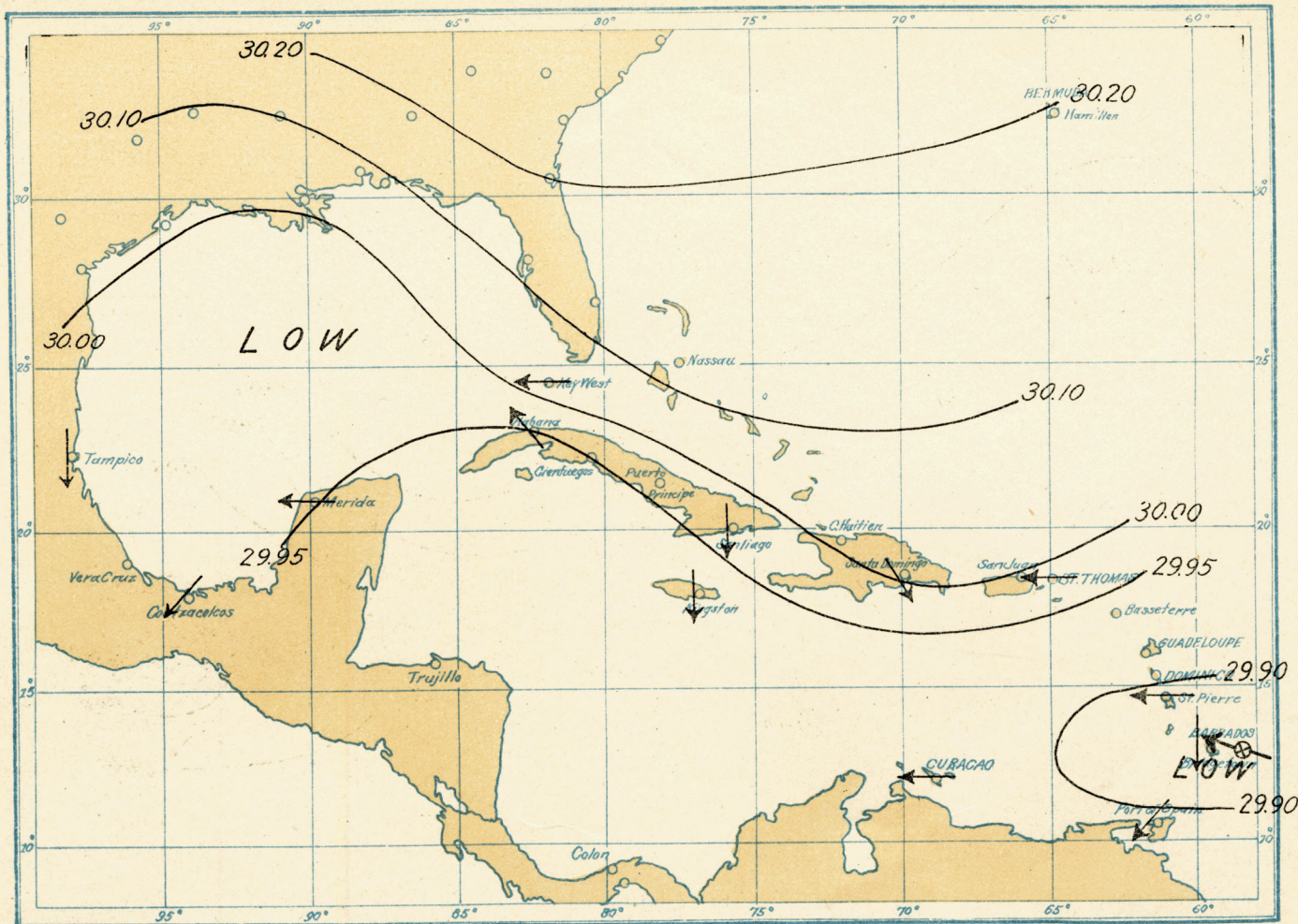


Chart XIV. Weather Charts. September 10, 1898—Morning.



Evening.

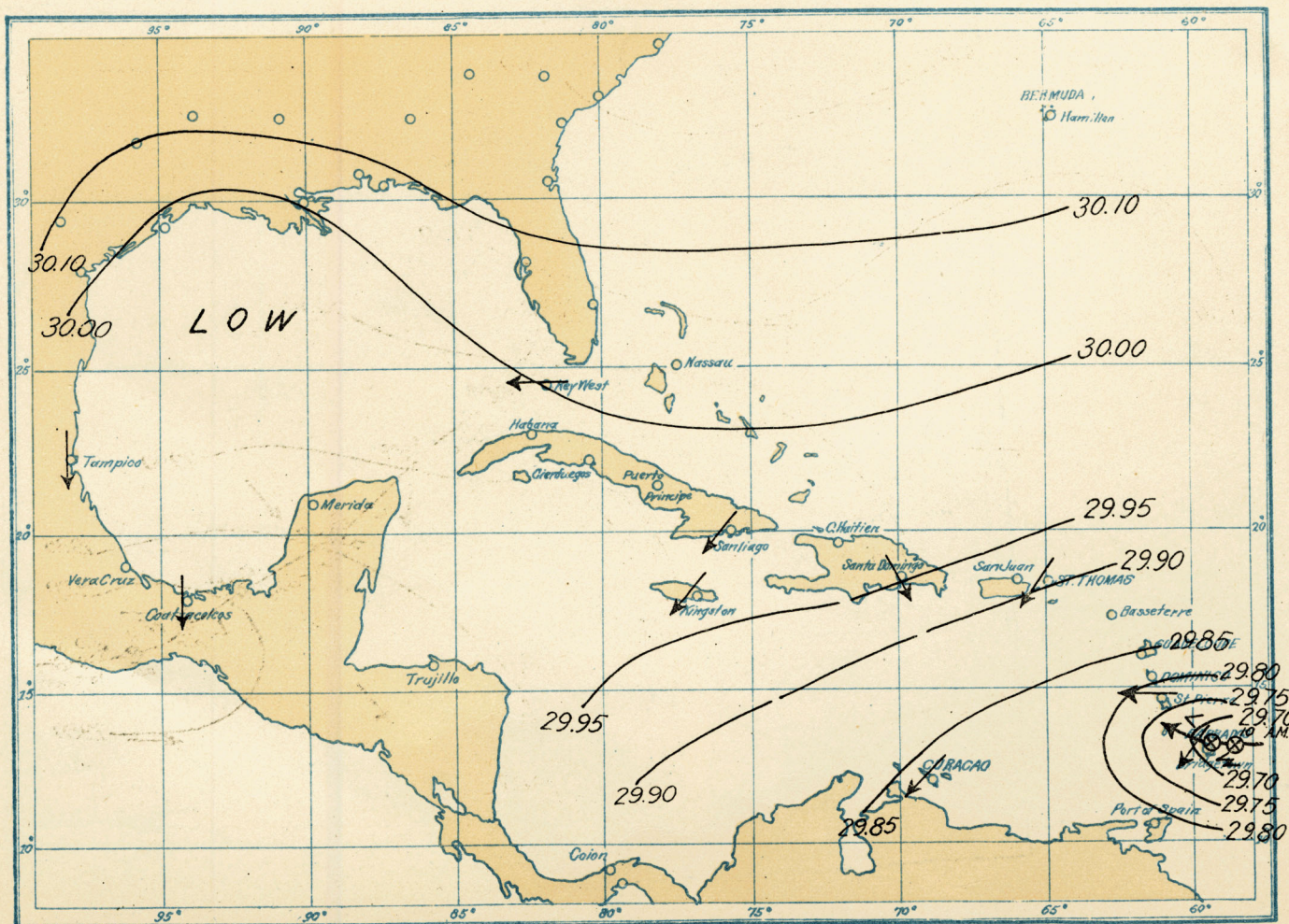
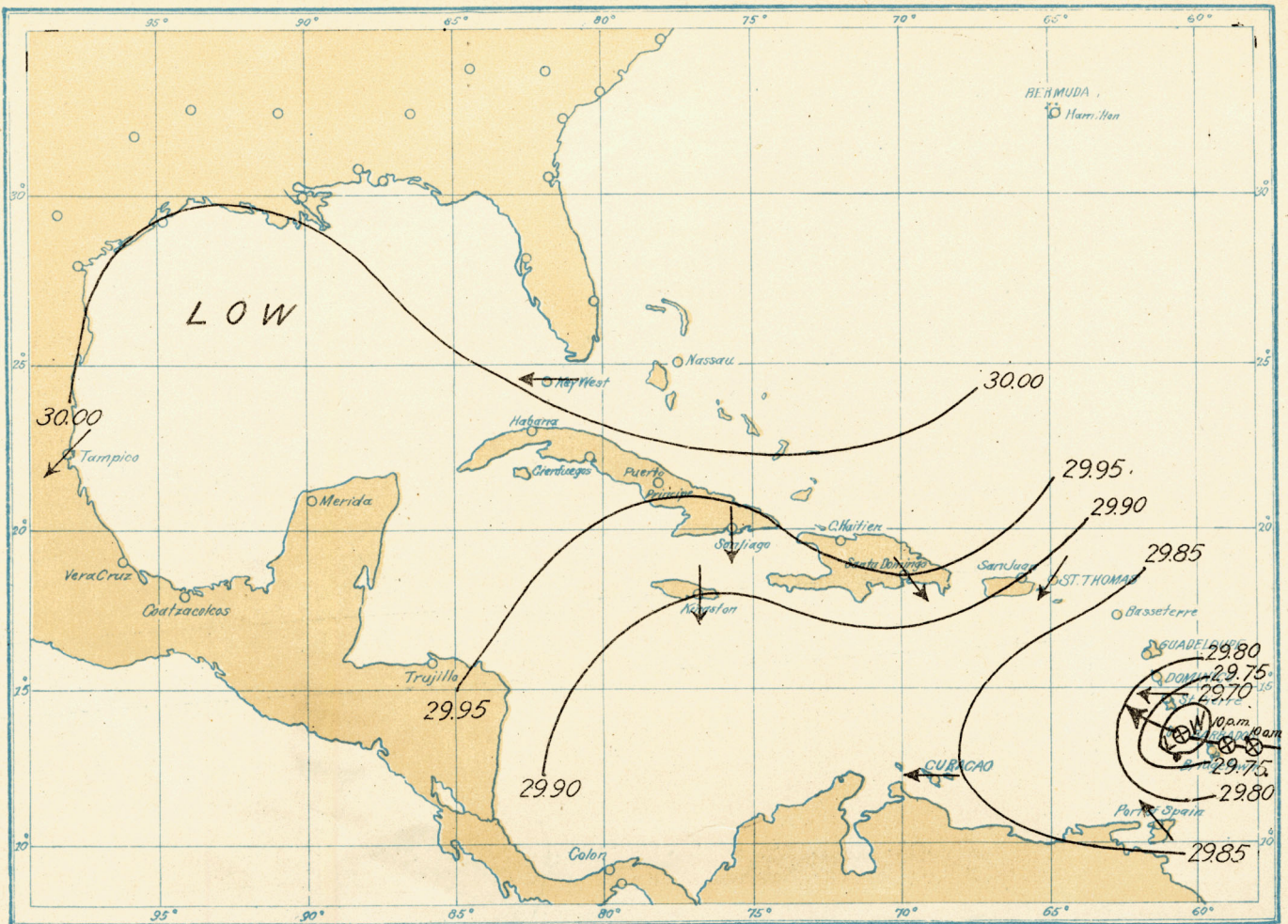


Chart XV. Weather Charts. September 11, 1898—Morning.



Evening.

